

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

What is claimed is:

1. An isolated and purified polynucleotide encoding an archaeal RFA, wherein the polynucleotide is selected from the group consisting of: a polynucleotide comprising the nucleotide sequence set forth in Figure 16 (SEQ ID NO: ); and a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 17 (SEQ ID NO: ).
2. The polynucleotide of claim 1, wherein the polynucleotide is cDNA.
3. The polynucleotide of claim 1, wherein the polynucleotide is mRNA.
4. An isolated and purified polynucleotide encoding an archaeal helicase, wherein the polynucleotide is selected from the group consisting of: (a) a polynucleotide comprising the nucleotide sequence set forth in Figure 22 (SEQ ID NO: ); (b) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 29 (SEQ ID NO: ); (c) a polynucleotide comprising the nucleotide sequence set forth in Figure 23 (SEQ ID NO: ); (d) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 30 (SEQ ID NO: ); (e) a polynucleotide comprising the nucleotide sequence set forth in Figure 24 (SEQ ID NO: ); (f) a polynucleotide encoding an amino acid sequence comprising the amino acid

sequence set forth in Figure 31 (SEQ ID NO: ); (g) a polynucleotide comprising the nucleotide sequence set forth in Figure 25 (SEQ ID NO: ); (h) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 32 (SEQ ID NO: ); (i) a polynucleotide comprising the nucleotide sequence set forth in Figure 26 (SEQ ID NO: ); (j) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 33 (SEQ ID NO: ); (k) a polynucleotide comprising the nucleotide sequence set forth in Figure 27 (SEQ ID NO: ); (l) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 34 (SEQ ID NO: ); (m) a polynucleotide comprising the nucleotide sequence set forth in Figure 28 (SEQ ID NO: ); (n) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 35 (SEQ ID NO: ); (o) a polynucleotide comprising the nucleotide sequence set forth in Figure 40 (SEQ ID NO: ); (p) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 41 (SEQ ID NO: ); and (o) an analog or degenerate variant of (a) through (p).

5. The polynucleotide of claim 4, wherein the polynucleotide is cDNA.
6. The polynucleotide of claim 4, wherein the polynucleotide is mRNA.
7. A vector comprising the polynucleotide of claim 1.

8. The vector of claim 7, wherein the vector is a plasmid.
9. The vector of claim 7, wherein the vector is a bacteriophage.
10. The vector of claim 7, wherein the vector is a retrovirus.
11. The vector of claim 7, wherein the vector is an adenovirus.
12. A host cell comprising the vector of claim 7.
13. The host cell of claim 12, wherein the host cell is a prokaryotic cell.
14. The host cell of claim 12, wherein the host cell is a eukaryotic cell.
15. A vector comprising the polynucleotide of claim 4.
16. The vector of claim 15, wherein the vector is a plasmid.
17. The vector of claim 15, wherein the vector is a bacteriophage.
18. The vector of claim 15, wherein the vector is a retrovirus.
19. The vector of claim 15, wherein the vector is an adenovirus.
20. A host cell comprising the vector of claim 15.
21. The host cell of claim 20, wherein the host cell is a prokaryotic cell.

22. The host cell of claim 20, wherein the host cell is a eukaryotic cell.
23. A method for producing replication accessory factors comprising:  
expressing the polynucleotide of the vector of claim 7 in a host cell; and  
purifying the expressed product.
24. The method of claim 23, wherein the host cell is a prokaryotic cell.
25. The method of claim 23, wherein the host cell is a eukaryotic cell.
26. A recombinant protein produced by the method of claim 23.
27. A method for producing replication accessory factors comprising:  
expressing the polynucleotide of the vector of claim 15 in a host cell; and  
purifying the expressed product.
28. The method of claim 27, wherein the host cell is a prokaryotic cell.
29. The method of claim 27, wherein the host cell is a eukaryotic cell.
30. A recombinant protein produced by the method of claim 27.
31. An isolated and purified archaeal polypeptide selected from the group  
consisting of RFA, helicase dna2, helicase 2, helicase 3, helicase 4, helicase 5,  
helicase 6, and helicase 7.

32. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is RFA.

33. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 2.

34. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 3.

35. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 4.

36. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 5.

37. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 6.

38. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase 7.

39. The isolated and purified archaeal polypeptide of claim 31, wherein the polypeptide is helicase dna2.

40. A composition for enhancing nucleic acid polymerase reactions comprising at least one archaeal polypeptide selected from the group consisting of: RFA, helicase dna2, helicase 2, helicase 3, helicase 4, helicase 5, helicase 6, and helicase 7.

41. The composition of claim 40, further comprising a polymerase.

42. The composition of 41, wherein the polymerase is Pfu polymerase.

43. The composition of 41, wherein the polymerase is *P. furiosus* pol II.

44. The composition of claim 41, further comprising a second polymerase.

45. The composition of claim 44, wherein the second polymerase lacks 3' to 5' exonuclease activity.

46. The composition of claim 45 wherein the second polymerase is Taq, Tth, Tfl, or Tbr polymerase.

47. The composition of claim 40, further comprising an archaeal dUTPase.

48. The composition of claim 40, wherein the archaeal dUTPase is PEF.

49. A method of enhancing a nucleic acid polymerase reaction comprising employing the composition of claim 40 in the nucleic acid polymerase reaction.

50. A method of synthesizing a nucleic acid of interest comprising employing the composition of claim 40 in a nucleic acid synthesis reaction.

51. A method of amplifying a nucleic acid of interest comprising employing the composition of claim 40 in a nucleic acid amplifying reaction.

52. A method of mutagenizing a nucleic acid comprising employing the composition of claim 40 when mutagenizing the nucleic acid.

53. A method for allowing higher temperatures and/or lower ionic strength in a nucleic acid hybridization procedure comprising including PCNA in the nucleic acid hybridization procedure.

54. A method for increasing stability of nucleic acid duplexes in a nucleic acid polymerase reaction comprising including an archaeal accessory factor in the polymerization reaction.

55. The method of claim 54, wherein the archaeal accessory factor comprises PCNA.



56. A method for enhancing an exonuclease reaction comprising including an archaeal accessory factor in the exonuclease reaction.

57. An isolated and purified polynucleotide encoding an archaeal RFA comprising: (a) a polynucleotide comprising the nucleotide sequence set forth in Figure 16 (SEQ ID NO: ) or the nucleotide sequence of Figure 16 starting with nucleotide 7; (b) a polynucleotide encoding an amino acid sequence comprising the amino acid sequence set forth in Figure 17 (SEQ ID NO: ) or the amino acid sequence of Figure 17 starting with amino acid 3; or (c) an analog or degenerate variant of (a) or (b).

58. The polynucleotide of claim 57, wherein the polynucleotide is cDNA.

59. The polynucleotide of claim 57, wherein the polynucleotide is mRNA.

60. An isolated and purified archaeal polypeptide selected from the group consisting of RFA, helicase dna2, helicase 2, helicase 3, helicase 4, helicase 5, helicase 6, and helicase 7.

61. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 17 (SEQ ID NO: ) or the amino acid sequence of Figure 17 starting with amino acid 3.

62. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 29 (SEQ ID NO: ).

63. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 30 (SEQ ID NO: ).

64. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 31 (SEQ ID NO: ).

65. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 32 (SEQ ID NO: ).

66. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 33 (SEQ ID NO: ).

67. The isolated and purified archaeal polypeptide of claim 60 comprising the amino acid sequence of Figure 34 (SEQ ID NO: ).

68. A kit for use in enhancing nucleic acid polymerase reactions comprising the composition of claim 40.

69. The kit of claim 68, further comprising an archaeal dUTPase.

70. The kit of claim 69, wherein the archaeal dUTPase is PEF from *Pyrococcus furiosus*.

71. A kit for use in synthesizing nucleic acids of interest comprising the composition of claim 40.

72. A kit for use in amplifying nucleic acids of interest comprising the composition of claim 40.

73. A kit for use in mutagenizing nucleic acids comprising the use of the composition of claim 40.

74. A kit comprising the composition of claim 40.